

REMARKS / ARGUMENTS

In complete response to the outstanding Official Action of March 20, 2006, on the above-identified application, reconsideration is respectfully requested. Claims 14 - 30, and 45 - 50 remain in this application. Claims 1-13, and 31 - 44 have been cancelled.

Claims 14, 16, 23, and 24 have been amended to better define the invention.

Claims 14 and 16 have been amended to replace the term "cooling" with the more accurate term "expanding".

Claims 23 and 24 have been amended to replace the term "cooled by expansion in a dry ice press" to the more accurate term ", expanded in a dry ice press".

Support for these amendments may be found at numerous places in the specification, for example:

- "The liquid CO₂ is expanded inside a dry ice manufacturing press to form a mixture of dry ice solid and cold gas." (*page 15, lines 11 - 13*)
- "The liquid carbon dioxide/ozone mixture is then expanded to generate dry ice, "snow", containing ozone, oxygen, and dry ice - "ozonated dry ice." (*page 16, lines 13 - 15*)
- "As further shown in Figure 1, the mixture of liquid CO₂ and ozone is allowed to expand inside the dry ice press 20. During expansion, the liquid CO₂ is converted to a solid form and the ozone is trapped in the structural lattices of the dry ice and/or by physical absorption during dry ice formation." (*page 18, line 25 - page 19, line 3*)
- "In the pelletizer, the liquid CO₂ is expanded to a pressure below 70 psig. What results is a mixture of gas and carbon dioxide solid particles." (*page 20, lines 1 - 3*)

- “The liquid CO₂ is allowed to expand inside the dry ice pelletizer 34 and is converted to a solid form.” (*page 20, lines 10 – 11*)

Claim Rejections Under 35 U.S.C. § 102

Claims 14 – 18, and 48 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Japanese reference '896. Applicants respectfully submit that claims 14 – 18 and 48 are not anticipated by Japanese reference '896.

The Japanese reference '896 teaches a method that requires:

- a) contacting pressurized ozone with liquid carbon dioxide in an ozone absorption chamber (*page 552, left column, second full paragraph*),
- b) it is “indispensable” that the conditions within the ozone absorption chamber be maintained at a temperature between 31.0°C and – 56.6°C, and at a pressure at or above 5.3 atmospheres (i.e. the triple point of carbon dioxide) (*page 552, left column, third full paragraph*)

At this point, the ultimate use of the ozonated carbon dioxide liquid must be determined. Clearly it was anticipated that his ozonated carbon dioxide may be used in the solid state, as indicated in the following passage:

“A manufacturing method for condensed carbon dioxide containing ozone characterized in that liquid carbon dioxide is dissolved in ozone or liquid carbon dioxide containing ozone is solidified by cooling.” (*page 551, “Scope of Patent Claims” section*)

It is just a clear that it was anticipated that this ozonated carbon dioxide may be used in the liquid state, as indicated in the following passage:

"The condensed carbon gas containing ozone obtained in the foregoing manner is used to generate ozone by a method such as increasing temperature or decreasing pressure (for example, in the case of liquid carbon gas containing ozone, this is discharged from a nozzle)." (*page 552, right column, first full paragraph*)

If the solid phase is desired, the Japanese reference '896 method continues by requiring that the ozonated carbon dioxide be cooled and solidified.

As disclosed in Hyde, Jr. '948, the traditional method for obtaining solid carbon dioxide from pressurized liquid carbon dioxide involves the rapid reduction of pressure (i.e. "flashing"), during which time the carbon dioxide is allowed to expand adiabatically (i.e. no heat transfer to or from the system). This results in approximately one half of the pressurized carbon dioxide liquid evaporating into the vapor phase, with this heat of vaporization being exchanged *within the system* with the other half of the liquid carbon dioxide, which thereby solidifies. (*see generally column 3, lines 22 – 34*)

This is entirely different from the process disclosed, and required by the Japanese reference '896. This is illustrated with great clarity in the following passage:

"The unabsorbed oxygen, ozone and evaporated carbon gas are discharged to the outside of the container by a relief valve. Next, 50 ml of the liquid carbon gas containing 5 vol% of ozone obtained in this way is sent to another pressure-resistant container, cooled by a dry ice-ether freezing mixture, and solidified, after which the pressure in the container is gradually reduced, and returned to atmospheric pressure to obtain 72 g of dry ice containing 3.5 g of the ozone." (*page 552, right column, last full paragraph*).

One skilled in the art, upon reading the Japanese reference '896, would realize that this is an entirely different process for solidifying liquid carbon dioxide. It is not adiabatic, there is heat leaving this system by way of the "dry ice-ether freezing mixture". This is made clear by the dry ice yield of 72 g from 50 ml of liquid carbon dioxide/ozone mixture. The skilled artisan would recognize this as 100% of the liquid having frozen, rather than approximately 50% as would be the case with the typical adiabatic method, as disclosed in Hyde, Jr. '948.

Additional evidence that the method of the Japanese reference '896 is fundamentally different than the traditional adiabatic method, as disclosed in Hyde, Jr. '948, may be found in the following passage (from the '896 reference):

"If necessary, it is further sent to a cooling process, where the carbon dioxide containing ozone is solidified by cooling at a temperature and pressure at which it can maintain solidity, and becomes solid carbon containing ozone (dry ice). This dry ice may also be returned to atmospheric pressure while being kept at or below the sublimation temperature." (*page 552, left column, last full paragraph*)

This passage clearly indicates that the pressure of the liquid carbon dioxide/ozone mixture must be maintained at above atmospheric pressure *during* the freezing process, and may only be reduced *after* the freezing process. This is in striking contrast to the traditional method, as disclosed in Hyde, Jr. '948, which requires that the pressure be reduced to atmospheric *during* the freezing process.

Also note that one skilled in the art would recognize that the sublimation temperature of solid carbon dioxide, at one atmosphere of pressure, is approximately -78.5°C (-109.3°F). The above passage from the Japanese reference '896 would thus require that the pressure of the dry ice can only be reduced in an environment that is at or below -109.3°F , which would never be the case with the traditional dry ice fabrication plants (using the method disclosed in

Hyde, Jr. '948), as these horns and presses are typically un-refrigerated and operate at room temperature.

One skilled in the art would recognize that the Japanese reference '896 fails to disclose every element of the present invention, as currently claimed in claims 14-18 and 47. Thus the § 102 rejection is unsupported and should be withdrawn.

Claim Rejections Under 35 U.S.C. § 103

Claims 19-27, 45-47, 49, and 50 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Japanese reference '896 in view of Hyde '948. Applicants respectfully submit that claims 19-27, 45-47, 49, and 50 are not unpatentable over Japanese reference '896 in view of Hyde '948.

The Examiner notes that "the Japanese '896 reference discloses applicants' basic inventive concept, a method for forming dry ice with entrained ozone, substantially as claimed with the exception of forming the dry ice into blocks or pellets." As discussed above, the Japanese reference '896 does not disclose the present invention, as currently claimed. As discussed above, there is not motivation to combine the teaching of the Japanese reference '896 and the teachings of Hyde, Jr. '948. One skilled in the art would find that the methods disclosed in these two references are fundamentally different from one another, and would find nothing to motivate the combination of the two. Thus the § 103 rejection is moot.

Claims 28 - 30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Hyde '948 in view of Slattery et al. '711. Applicants respectfully submit that claims 28 - 30 are not unpatentable over Hyde '948 in view of Slattery et al. '711.

The Examiner notes that "Hyde discloses applicants' basic inventive concept, a dry ice forming machine that expands liquid carbon dioxide to form dry ice which may be pressed into blocks or pellets, substantially as claimed with the exception of contacting the solid formed with gaseous ozone."

Hyde, Jr. '948 discloses "an apparatus for extruding various shapes and sizes of solid carbon dioxide units." (*abstract*). It discloses the process of taking pressurized liquid carbon dioxide, creating carbon dioxide snow, then extruding this snow in various shapes.

Slattery et al. '711, discloses:

"The present invention relates to a system and method for making ice, transporting the ice to a remote location and *sanitizing the ice transportation system*. Specifically, the invention relates to introducing ozone gas into the ice transportation system and maintaining the ozone gas in the system for a sufficient time and at a sufficient concentration to *sanitize the ice transportation system*."
(*column 1, lines 6 – 12, emphasis added*)

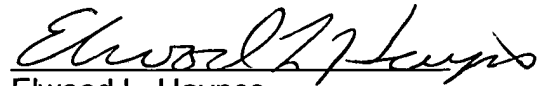
These are not analogous arts. One skilled in the production of dry ice would not look to the teachings of a patent directed at the production of wet ice. Also, Applicants respectfully point out that the Examiner has inadvertently mischaracterized the teachings of Slattery et al. '711, as Slattery et al. '711 does not disclose contacting the ice with ozone, but only the "distribution line" (claim 1), "remote storage container" (claim 10), "transportation system" (claim 11), or "ice delivery tube" (claim 13).

One skilled in the art would find that the methods disclosed in these two references are fundamentally different from one another, and would find nothing to motivate the combination of the two. Thus the § 103 rejection is moot.

CONCLUSION

Accordingly, it is believed that the present application now stands in condition for allowance. Early notice to this effect is earnestly solicited. Should the examiner believe a telephone call would expedite the prosecution of the application, he is invited to call the undersigned attorney at the number listed below.

Respectfully submitted,



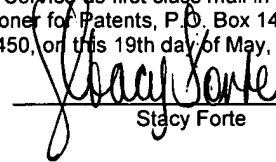
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CERTIFICATE OF MAILING UNDER 37 CFR 1.8(a)

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 19th day of May, 2006.


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